Digital Management System
BroadcastTransmitter

FMX30,FMX100 and FMX250

User's Manual

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Important Notices

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Table of Contents

Table of Contents iii

Section 1—Getting Acquainted

1.1 Your Transmitter 1-2
1.2 Applications and Options....1-3
1.2.1 Stand-Alone....1-4
1.2.2 Backup 1-4
1.2.3 Booster....1-4
1.2.4 Exciter 1-4
1.2.5 Translator....1-5
1.2.6 Satellator....1-6
1.2.7 Nearcasting 1-6
1.3 Transmitter/Exciter Specifications 1-7
1.4 Receiver Specifications....1-9
1.5 Safety Considerations....1-10
1.5.1 Dangers....1-10
1.5.2 Warnings....1-10
1.5.3 Cautions....1-10

Section 2—Installation

2.1 Operating Location 2-2
2.2 Power Connections....2-2
2.2.1 AC Line Voltage Setting....2-2
2.2.2 Fuses....2-4
2.3 Frequency (Channel) Selection 2-5
2.3.1 Modulation Compensator....2-5
2.3.2 RF Tuning Adjustments 2-5
2.4 Receiver Frequency Selection....2-6
2.5 RF Connections 2-8
2.6 Audio Input Connections 2-9
2.7 SCA Input Connections....2-11
2.8 Composite Input Connection 2-11
2.9 Audio Monitor Connections 2-12
2.10 Pre-emphasis Selection 2-12
2.11 Processor Bypass Option 2-12
2.12 Program Input Fault Time-out 2-13
2.13 Remote I/O Connector 2-14

Section 3—Operation

3.1 Initial Power-up Procedures 3-2
3.2 Controls and Display....3-2
3.2.1 Front Panel....3-2
3.2.2 DC Breaker 3-4
3.3 Operating the FMX....3-4

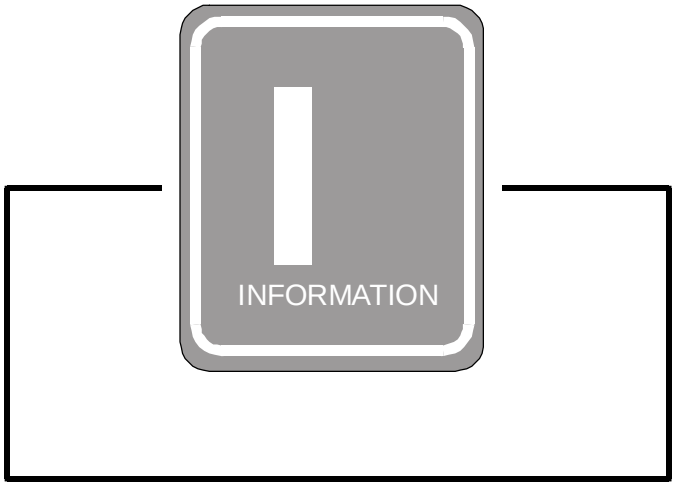
3.3.1 Passwords....3-4
3.3.2 Main Function List....3-4
3.3.3 Readings Function List....3-5
3.3.4 Settings Function List....3-6
3.3.5 Factory Setting Functions....3-7
3.3.6 Audio Monitor....3-7
3.3.7 Fault Log....3-7
3.4 Power-up procedure....3-8
3.4.1 Apply Power....3-8
3.4.2 Enter Initial Settings....3-8
3.4.3 Transmit....3-8

Section 4—Principles of Operation

4.1 Block Diagram....4-2
4.2 Audio Processor Circuit Board....4-3
4.2.1 Balanced Input....4-3
4.2.2 Audio Processor....4-3
4.3 Stereo Generator Circuit Board....4-4
4.3.1 Low-pass filter....4-4
4.3.2 Stereo Generator....4-5
4.3.3 SCA Input....4-5
4.3.4 Processed Audio....4-5
4.4 RF Exciter Circuit Board....4-6
4.5 Digital Management System....4-7
4.5.1 Metering Boards....4-7
4.5.2 Front Panel....4-7
4.6 Motherboard....4-8
4.7 Voltage Regulator Circuit Board....4-8
4.8 Power Regulator Circuit Board....4-9
4.9 RF Driver/Amplifier (FM30)....4-9
4.10 RF Driver (FM100/FM250)....4-9
4.11 RF Amplifier (FM100/FM250)....4-9
4.12 Chassis....4-10
4.13 RF Output Filter & Reflectometer....4-11
4.14 Receiver Circuit Board Option....4-11

Section 5—Service and Support

5.1 Service....4-2
5.2 24–Hour Support....4-2
5.3 Spare Parts....4-2



Section 1—Getting Acquainted

This section provides a general description of the FMX30, FMX100, and FMX250 transmitters and introduces you to safety conventions used within this document. *Review this material* before installing or operating the transmitter.

1.1 Your Transmitter

The FMX30, FMX100, and FMX250 are members of a family of FM stereo broadcast transmitters. Crown transmitters are known for their integration, ease-of-use, and reliability.

The integration is most apparent in the standard transmitter configuration which incorporates audio processing, stereo generation, and RF amplification without compromised signal quality. A single Crown transmitter can replace several pieces of equipment in a traditional system.

Ease-of-use is apparent in the user-friendly front panel interface and in the installation procedure. Simply select your operating frequency add an audio source, attach an antenna, and connect AC or DC power and you're ready to broadcast. Of course, the FM series of transmitters also feature more sophisticated inputs and monitoring connections if needed.

Reliability is a Crown tradition. The first Crown transmitters were designed for rigors of worldwide and potentially portable use. The modular design, quality components, engineering approach, and high production standards ensure stable performance. For more direct monitoring, the front panel includes a single control knob, a four line display and bar graph indicators. Automatic control circuitry provides protection for high VSWR as well as high current, voltage, and temperature conditions.

Illustration 1–1 FMX250 FM Broadcast Transmitter

This manual describes the FMX30, FMX100, and FMX250
Because all three transmitters share common design factors. Specific product differences are noted throughout the manual. In physical appearance, the FMX30 differs from the FMX100 and FMX250 in that it lacks the power amplifier and cooling fan assembly on the back panel.

1.2 Applications and Options

Crown transmitters are designed for versatility in applications. They have been used as stand-alone and backup transmitters and in booster, translator, satellator, and nearcast applications. The following discussion describes these applications further.

Model numbers describe the configuration of the product (which has to do with its intended purpose) and the RF output power which you can expect.

The number portion of each name represents the maximum RF output power. The FMX250, for example, can generate up to 250 watts of RF output power.

Suffix letters describe the configuration. The FMX250T, for example, is the standard or transmitter configuration. Except where specified, this document describes the transmitter configuration. In this configuration, the product includes the following components (functions):

- audio processor
- stereo generator
- RF exciter
- metering
- low-pass filter

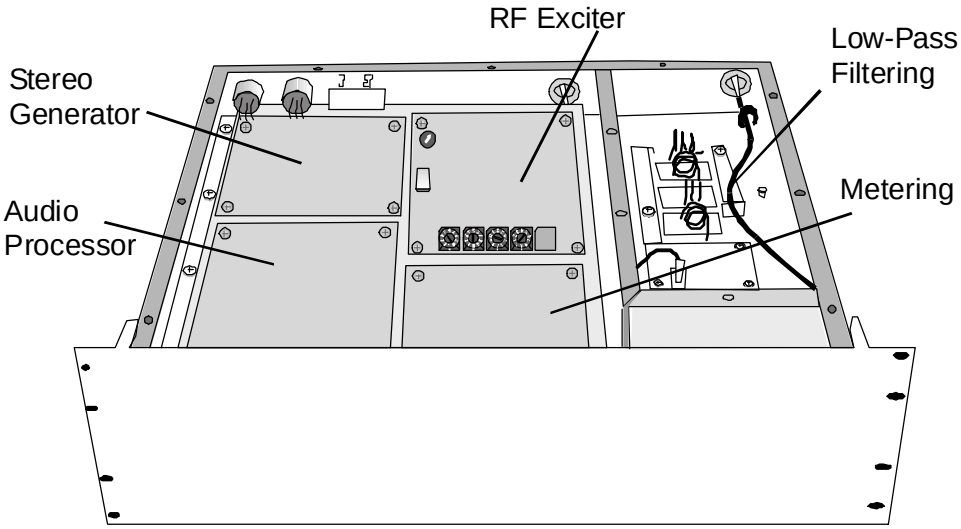


Illustration 1–2 Standard (Transmitter) Configuration

1.2.1 Stand-Alone

In the standard configuration, the FMX30, FMX100, and FMX250 are ideal stand-alone transmitters. When you add an audio source (monaural, L/R stereo, or composite signal), an antenna, and AC or DC power, the transmitter becomes a complete FM stereo broadcast station, capable of serving a community.

As stand-alone transmitters, Crown units often replace multiple pieces of equipment in a traditional setup (exciter, audio processor, RF amplifier).

1.2.2 Backup

In the standard configuration, Crown transmitters are also used in backup applications. Should your primary transmitter become disabled, you can continue to broadcast while repairs take place. In addition, the FM transmitters can replace disabled portions of your existing system including the exciter, audio processor, or amplifier. Transfer switches on each side of the existing and backup transmitters make the change-over possible with minimal downtime.

The DC operation option of the FMX30, FMX100, and FMX250 make them attractive backup units for those times when AC power is lost.

1.2.3 Booster

Also in the standard configuration, Crown transmitters have been used as booster transmitters. Booster applications typically involve certain geographic factors which prevent your system from broadcasting to the full coverage area allowable. For example, a mountain range might block your signal to a portion of your coverage area. Careful placement of a Crown transmitter, operating on the same frequency as your primary transmitter, can help you reach full coverage. An external receiver and special antenna are required to use Crown FM transmitters as boosters.

1.2.4 Exciter

In addition to the standard configuration, Crown FM transmitters are available in optional configurations to meet a variety of needs.

An “E” suffix, as in the FMX30E, for example, represents an exciter-only configuration. In this configuration, the audio processor and stereo generator boards are replaced with circuitry to bypass their function. The exciter configurations are the least expensive way to get Crown-quality components into your transmission system.

You might consider the Crown exciter when other portions of your system are performing satisfactorily and you want to maximize your investment in present equipment.

1.2.5 Translator

The FMX30R receiver option replaces the audio processor and stereo generator boards with a receiver module. This added feature makes Crown transmitters ideal for translator service in terrestrial-fed networks. These networks represent a popular and effective way to increase your broadcasting coverage. Translators, acting as repeater emitters, are necessary links in this chain of events.

Traditionally, network engineers have relied on multiple steps and multiple pieces of equipment to accomplish the task. Others have integrated the translator function (receiver and exciter) to feed an amplifier. Crown, on the other hand, starts with an integrated transmitter and adds a solid-state Receiver Module to form the ideal translator.

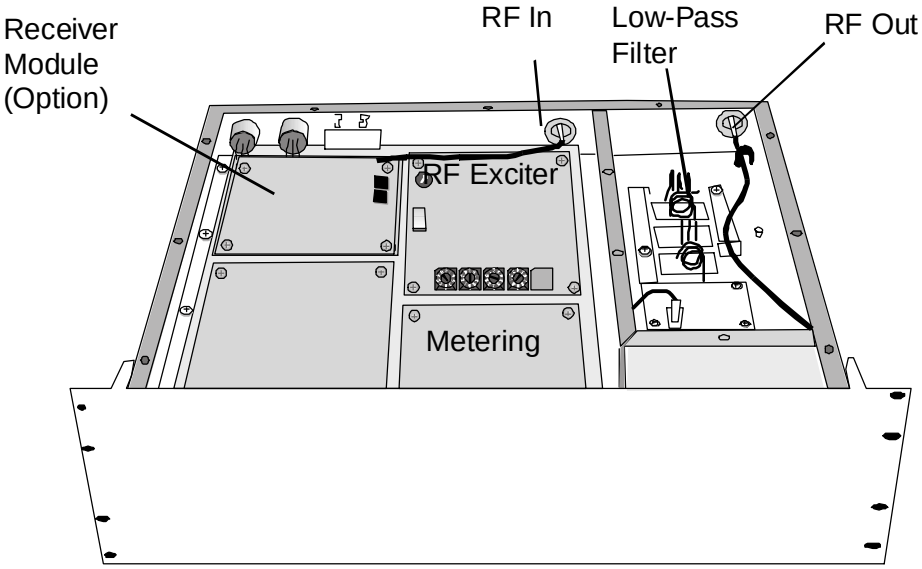


Illustration 1–3 Crown's Integrated Translator

This option enables RF in and RF out on any of Crown's FM series of transmitters. In addition, the module supplies a composite output to the RF exciter portion of the transmitter. From here, the signal is brought to full power by the built-in power amplifier for retransmission. The Receiver Module has been specifically designed to handle SCA channel output up to 100 kHz for audio and high-speed data.

FSK ID programming is built-in to ensure compliance with FCC regulations regarding the on-air identification of translators. Simply specify the call sign of the repeater station when ordering. Should you need to change the location of the translator, replacement FSK chips are available. The Receiver Module option should be ordered at the time of initial transmitter purchase. However, an option kit is available for field converting existing Crown units.

In the translator configuration there are differences in the function of the front panel, See Section 3.7, Digital Multimeter for a description.

1.2.6 Satellator

Crown transmitters include automatic call sign or operating frequency transmission in a Morse code style. This feature is intended for use in satellite-fed networks. Transmitters equipped in this fashion are often known as “satellators.”

Connect the transmitter to your satellite receiver and the built-in FSK IDer does the rest—shifting the frequency to comply with FCC requirements and in a manner that is unnoticeable to the listener.

1.2.7 Nearcasting

Some Crown units function as “nearcast” transmitters. Their low-power output is not designed for broadcasting a signal but for transmitting it to local receivers, sometimes within the same room. Crown transmitters have been used in this way for language translation, for rebroadcasting the audio of sporting events within a stadium, and for specialized local radio. Crown makes a dedicated nearcast transmitter. However, the FMX30 is also appropriate for this application.

1.3 Transmitter/Exciter Specifications

Frequency Range	87.9 -107.9 MHz
RF Power Output	(VSWR 1.5:1 or better)
FMX30	3-30 watts, adjustable
FMX100	10-100 watts, adjustable
FMX250	20-250 watts, adjustable
RF Output Impedance	50 Ω
Frequency Stability	Meets FCC specifications from 0-50 degrees C
Audio Input Impedance	50 k Ω bridging, balanced, or 600 Ω
Audio Input Level	Selectable for -10 dBm to +10 dBm for 75 kHz deviation at 400 Hz
Pre-emphasis	Selectable for 25, 50, or 75 µsec; or Flat
Audio Response	Conforms to 75 µsec pre-emphasis curve as follows
Complete transmitter	±0.30 dB (50 Hz-10 kHz)
	±1.0 dB (10 kHz-15 kHz)
Exciter only	±0.25 dB (50 Hz-15 kHz
Distortion (THD + Noise)	
Complete transmitter	Less than 0.7% (at 15 kHz)
Exciter only	Less than 0.3% (50 Hz-15 kHz)
Stereo Separation	
Complete transmitter	Better than -40 dB (50 Hz-15 kHz)
Exciter only	Better than -40 dB (50 Hz-15 kHz)
Crosstalk	Main into sub, better than -40 dB
	Sub into main, better than -40 dB
Stereo Pilot	19 kHz ±2 Hz, 9% modulation
Subcarrier Suppression	50 dB below ±75 kHz deviation
FM S/N Ratio (FM noise)	
Complete transmitter	Better than -60 dB
Exciter only	Better than -70 dB

AM S/N Ratio	Asynchronous and synchronous noise better than FCC requirements
RF Bandwidth	±120 kHz, better than -35 dB
	±240 kHz, better than -45 dB
RF Spurious Products	Better than -70 dB
Operating Environment	Temperature (0°C -50°C)
	Humidity (0-80% at 20°C)
	Maximum Altitude (3,000 meters; 9843 feet)
AC Power	100, 120, 220, or 240 volts (+10%/15%); 50/60 Hz
FMX30	115 VA
FMX100	297 VA
FMX250	550 VA
DC Power	
FMX30	24-36 volts (36 volts at 3 amps required for full output power)
FMX100	36-62 volts (48 volts at 5 amps required for full output power)
FMX250	36-62 volts (72 volts at 8 amps required for full output power)

Note: Note: We set voltage and ampere requirements to assist you in designing your system. Depending on your operating frequency, actual requirements for maximum voltage and current readings are 10-15% lower than stated.

Regulatory	Type notified for FCC parts 73 and 74 Meets FCC, DOC, and CCIR requirements
Dimensions	13.5 x 41.9 x 44.5 cm
	(5.25 x 16.5 x 17.5 inches)
Weight	
FMX30	10.5 kg (23 lbs) 13.6 kg (30 lbs) shipping weight
FMX100	11.4 kg (25 lbs)
FMX250	14.5 kg (32 lbs) shipping weight
	16.8 kg (37 lbs)20.0 kg (44 lbs) shipping weight

1.4 Receiver Specifications

Monaural Sensitivity (demodulated, de-emphasized)	3.5 µV for signal-to-noise > 50 dB
	12.6 µV for signal-to-noise > 60 dB
Stereo Sensitivity (19–kHz pilot frequency added)	2.8 µV for signal-to-noise > 40 dB
	8 µV for signal-to-noise > 50 dB
	31 µV for signal-to-noise > 60 dB
Connector	Standard type N, 50 Ω
Shipping Weight	1 lb

1.5 Safety Considerations

Crown Broadcast assumes the responsibility for providing you a safe product and safety guidelines during its use. “Safety” means protection to all individuals who install, operate, and service the transmitter as well as protection of the transmitter itself. To promote safety, we use standard hazard alert labeling on the product and in this manual. Follow the associated guidelines to avoid potential hazard.

1.5.1 Dangers

DANGER represents the most severe hazard alert. Extreme bodily harm or death will occur if DANGER guidelines are not followed.

1.5.2 Warnings

WARNING represents hazards which could result in severe injury or death.

1.5.3 Cautions

CAUTION indicates potential personal injury, or equipment or property damage if the associated guidelines are not followed. Particular cautions in this text also indicate unauthorized radio-frequency operation.

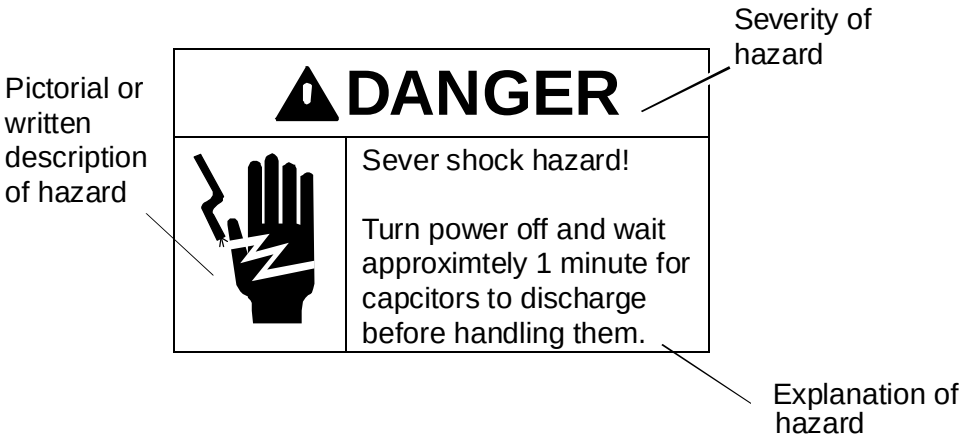
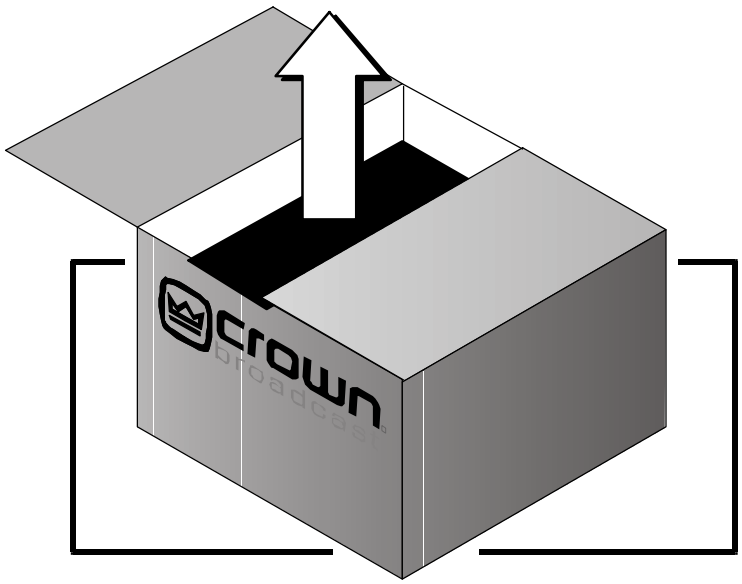
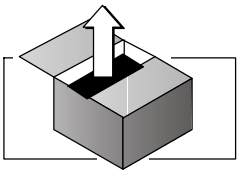

Severity of hazard
Pictorial or written description of hazard
DANGER
Sever shock hazard!
Turn power off and wait approximtely 1 minute for capcitors to discharge before handling them.
Explanation of hazard

Illustration 1–4 Hazard Warning



Section 2—Installation

This section provides important guidelines for installing your transmitter. Review this information carefully for proper installation.



⚠ CAUTION

Possible equipment damage!

Before operating the transmitter for the first time, check for the proper AC line voltage setting and frequency described in Section 2.2, Power Connections and Section 2.3, Frequency (Channel) Selection.

2.1 Operating Location

You can install the FM transmitter in a standard component rack or on a suitable surface such as a bench or desk. In any case, the area should be as clean and well-ventilated as possible. Always allow for at least 2 cm of clearance under the unit for ventilation. If you set the transmitter on a flat surface, install spacers on the bottom cover plate. If you install the transmitter in a rack, provide adequate clearance above and below. Do not locate the transmitter directly above a hot piece of equipment.

2.2 Power Connections

The FMX30, FMX100, and FMX250 operate on 100, 120, 220, or 240 volts AC (50 or 60 Hz; single phase). Each transmitter can operate on DC power as well (28 volts for the FMX30, 36 volts for the FMX100, and 62 volts for the FMX250). The transmitter can operate on lower DC voltage, but with reduced RF output power (see section 1.2). In addition, the transmitter isolates the AC and DC sources; both can be connected at the same time to provide battery backup in the event of an AC power failure.

2.2.1 AC Line Voltage Setting

To change the voltage setting, follow these steps:

1. Disconnect the power cord if it is attached.
2. Open the cover of the power connector assembly using a small, flat blade screwdriver. See Illustration 2–1, Removing the Power Connector Cover.
3. Insert the screwdriver into the voltage selection slot and remove the drum from the assembly.
4. Rotate the drum to select the desired voltage. See Section 2.2, Power Connections.
5. Replace the drum and cover and check to see that the correct voltage appears in the connector window.
6. Connect the AC power cord.

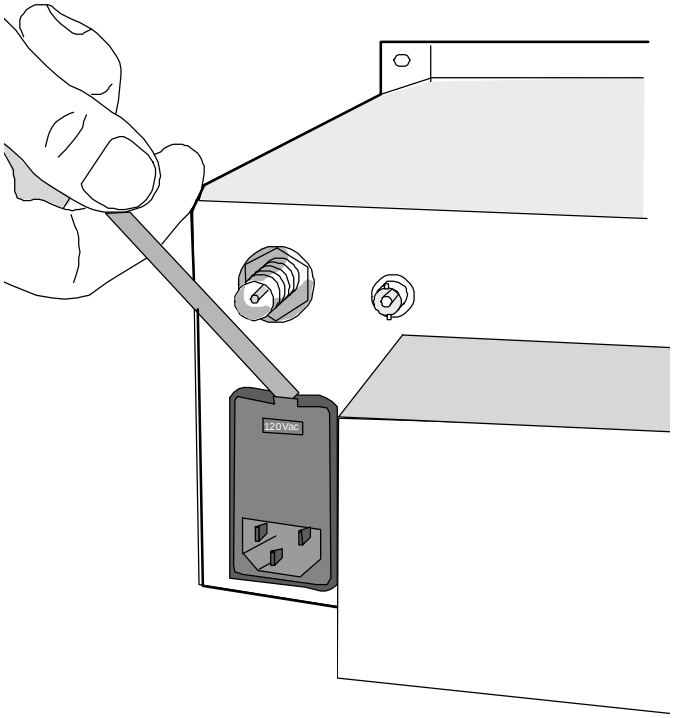


Illustration 2–1 Removing the Power Connector Cover

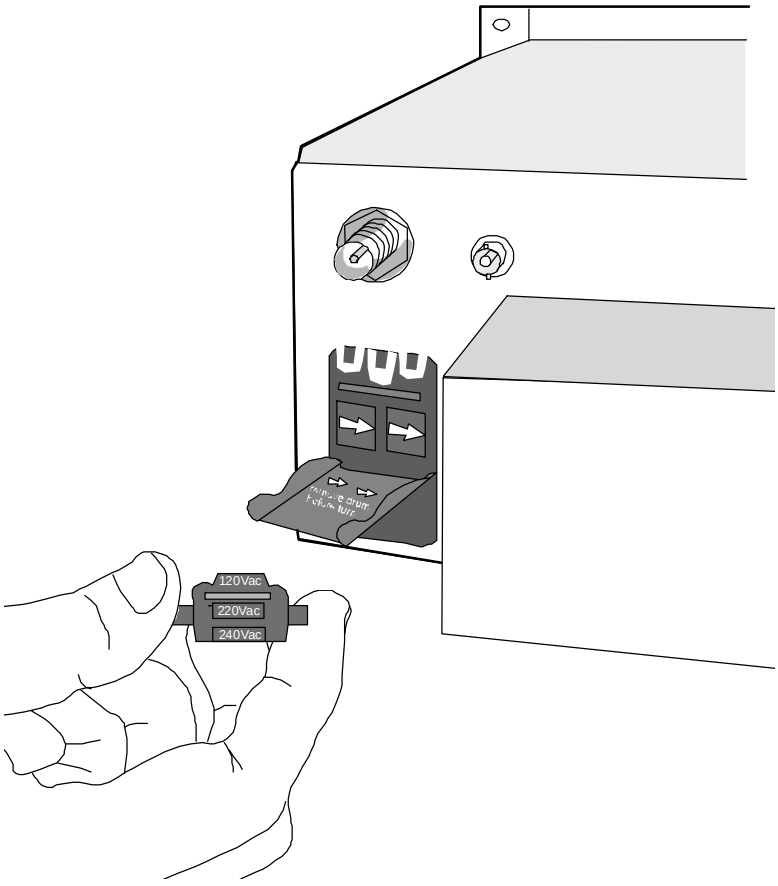


Illustration 2–2 Selecting an AC Line Voltage

2.2.2 Fuses

The fuse holders are located in the power connector assembly just below the voltage selector. :

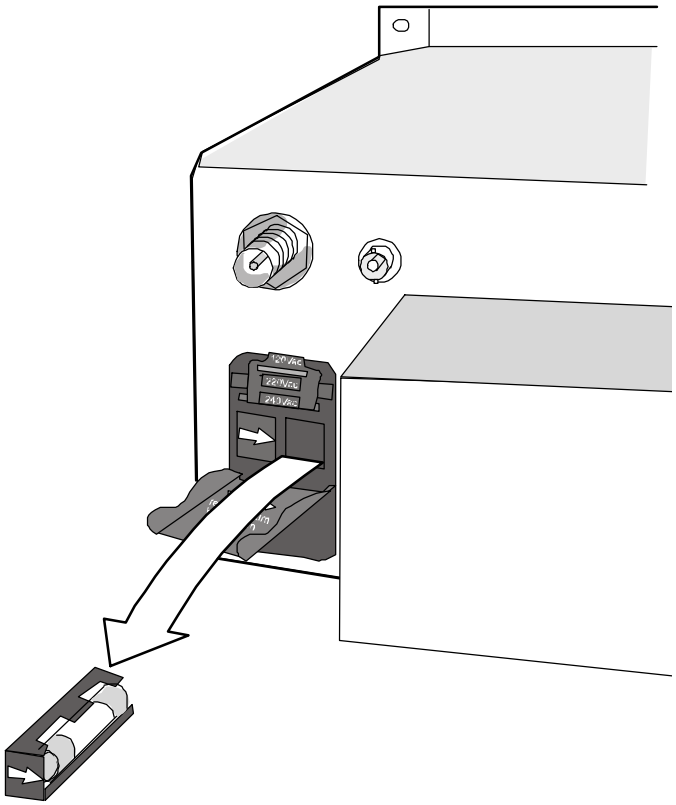


Illustration 2–3 Fuse Holder

For 100 to 120 VAC operation, use the fuse installed at the factory. For 220 to 240 VAC operation, use the slow-blow fuse located in a hardware kit within the transmitter packaging. Consult the following table:

Transmitter	Input Power	Fuse
FMX30	100-120 V 220-240 V	3A 1.5A
FMX100	100-120 V 220-240 V	6.3 4A
FMX250	100-120 V 220-240 V	12.5A 6.3A

Table 2-1 Fuse Chart

2.3 *Frequency (Channel) Selection*

The transmitting frequency for Crown FMX series transmitters is set from a front panel control. However, you must set the modulation compensator for the operating frequency.

2.3.1 Modulation Compensator

The Modulation trim-potentiometer, (see Section 2–4, Modulation Compensator Settings), compensates for slight variations in deviation sensitivity with frequency. Set the trim-pot dial according to the following graph:

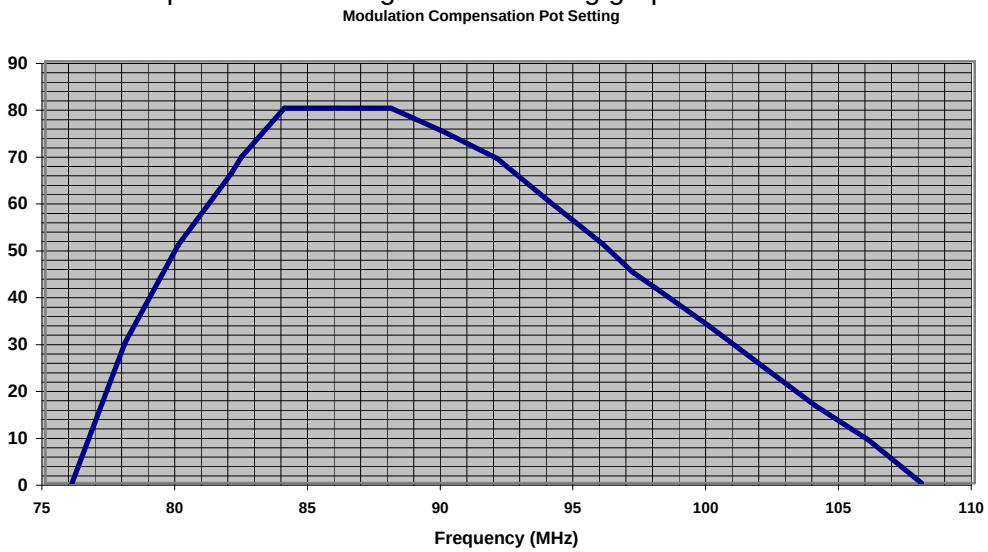


Illustration 2–4 Modulation Compensator Settings

These compensator settings are approximate. Each mark on the potentiometer represents about 1.8% modulation compensation. For more exact settings, see Section 5.2.2, Composite Output.

Replace the top cover before operating the transmitter.

2.3.2 RF Tuning Adjustments

All the RF stages are broadband to cover the 88 to 108 MHz broadcast band. The RF amplifier stages require no tuning.

Note: If you requested it, the FSK chip on the RF Exciter Board has been pre-programmed for your operating frequency. This chip is replaceable. Should you need to change the location of your translator, contact Crown Broadcast for a replacement chip with your new FSK ID. To disable auto ID, remove the jumper from the auto ID location on header HD2 on the RF Exciter Board.

2.4 Receiver Frequency Selection

If you have a transmitter equipped with the receiver option, you will need to set the receiving or incoming frequency.

1. With the top cover removed, locate the receiver module and the two switches (labeled SW1 and SW2).

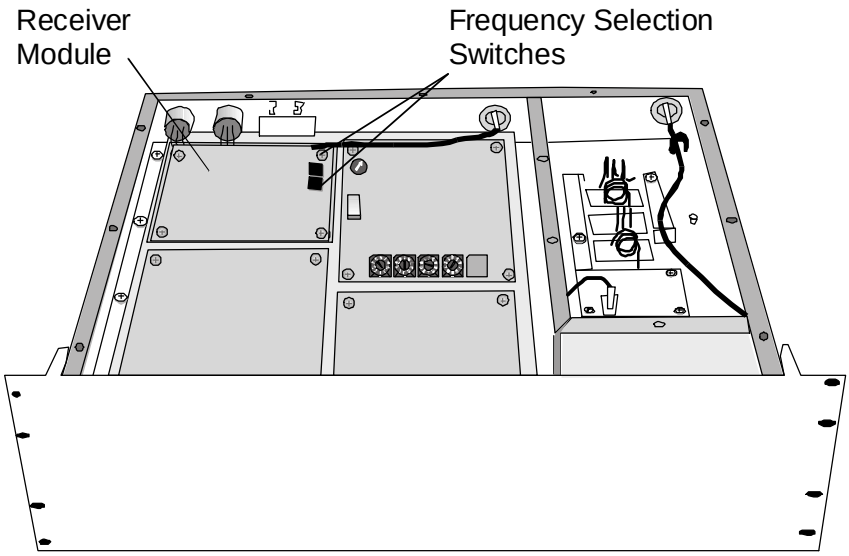


Illustration 2–5 Receiver Module Switches

2. Use Table 2-2, Receiver Frequency Selection, to set the switches for the desired incoming frequency.

After setting the frequency, return to Section 2.3.1, Modulation Compensator, to set the modulation compensator.

Note: If you requested it, the FSK chip on the RF Exciter Board has been pre-programmed for your operating frequency. This chip is replaceable. Should you need to change the location of your translator, contact Crown Broadcast for a replacement chip with your new FSK ID.

Replace the top cover before operating the transmitter.

Freq	SW1	SW2	Freq	SW1	SW2	Freq	SW1	SW2	Freq	SW 1	SW2
87.9	0	0	92.9	1	9	97.9	3	2	102.9	4	B
88.0	8	0	93.0	9	9	98.0	B	2	103.0	C	B
88.1	0	1	93.1	1	A	98.1	3	3	103.1	4	C
88.2	8	1	93.2	9	A	98.2	B	3	103.2	C	C
88.3	0	2	93.3	1	B	98.3	3	4	103.3	4	D
88.4	8	2	93.4	9	B	98.4	B	4	103.4	C	D
88.5	0	3	93.5	1	C	98.5	3	5	103.5	4	E
88.6	8	3	93.6	9	C	98.6	B	5	103.6	C	E
88.7	0	4	93.7	1	D	98.7	3	6	103.7	4	F
88.8	8	4	93.8	9	D	98.8	B	6	103.8	C	F
88.9	0	5	93.9	1	E	98.9	3	7	103.9	5	0
89.0	8	5	94.0	9	E	99.0	B	7	104.0	D	0
89.1	0	6	94.1	1	F	99.1	3	8	104.1	5	1
89.2	8	6	94.2	9	F	99.2	B	8	104.2	D	1
89.3	0	7	94.3	2	0	99.3	3	9	104.3	5	2
89.4	8	7	94.4	A	0	99.4	B	9	104.4	D	2
89.5	0	8	94.5	2	1	99.5	3	A	104.5	5	3
89.6	8	8	94.6	A	1	99.6	B	A	104.6	D	3
89.7	0	9	94.7	2	2	99.7	3	B	104.7	5	4
89.8	8	9	94.8	A	2	99.8	B	B	104.8	D	4
89.9	0	A	94.9	2	3	99.9	3	C	104.9	5	5
90.0	8	A	95.0	A	3	100.0	B	C	105.0	D	5
90.1	0	B	95.1	2	4	100.1	3	D	105.1	5	6
90.2	8	B	95.2	A	4	100.2	B	D	105.2	D	6
90.3	0	C	95.3	2	5	100.3	3	E	105.3	5	7
90.4	8	C	95.4	A	5	100.4	B	E	105.4	D	7
90.5	0	D	95.5	2	6	100.5	3	F	105.5	5	8
90.6	8	D	95.6	A	6	100.6	B	F	105.6	D	8
90.7	0	E	95.7	2	7	100.7	4	0	105.7	5	9
90.8	8	E	95.8	A	7	100.8	C	0	105.8	D	9
90.9	0	F	95.9	2	8	100.9	4	1	105.9	5	A
91.0	8	F	96.0	A	8	101.0	C	1	106.0	D	A
91.1	1	0	96.1	2	9	101.1	4	2	106.1	5	B
91.2	9	0	96.2	A	9	101.2	C	2	106.2	D	B
91.3	1	1	96.3	2	A	101.3	4	3	106.3	5	C
91.4	9	1	96.4	A	A	101.4	C	3	106.4	D	C
91.5	1	2	96.5	2	B	101.5	4	4	106.5	5	D
91.6	9	2	96.6	A	B	101.6	C	4	106.6	D	D
91.7	1	3	96.7	2	C	101.7	4	5	106.7	5	E
91.8	9	3	96.8	A	C	101.8	C	5	106.8	D	E
91.9	1	4	96.9	2	D	101.9	4	6	106.9	5	F
92.0	9	4	97.0	A	D	102.0	C	6	107.0	D	F
92.1	1	5	97.1	2	E	102.1	4	7	107.1	6	0
92.2	9	5	97.2	A	E	102.2	C	7	107.2	E	0
92.3	1	6	97.3	2	F	102.3	4	8	107.3	6	1
92.4	9	6	97.4	A	F	102.4	C	8	107.4	E	1
92.5	1	7	97.5	3	0	102.5	4	9	107.5	6	2
92.6	9	7	97.6	B	0	102.6	C	9	107.6	E	2
92.7	1	8	97.7	3	1	102.7	4	A	107.7	6	3
92.8	9	8	97.8	B	1	102.8	C	A	107.8	E	3
									107.9	6	4
									108.0	E	4

Table 2-2 Receiver Frequency Selection

2.5 RF Connections

Connect the RF load, antenna or the input of an external power amplifier, to the type-N, RF output connector on the rear panel. VSWR should be 1.5:1 or better.

⚠ Warning

Severe shock hazard!

Do not touch the inner portion of the RF output connector when transmitter power is on.

The RF monitor is intended primarily for a modulation monitor connection. Information gained through this connection can supplement that which is available on the transmitter front panel displays.

If your transmitter is equipped with the receiver option, connect the incoming RF to the RF IN connector.

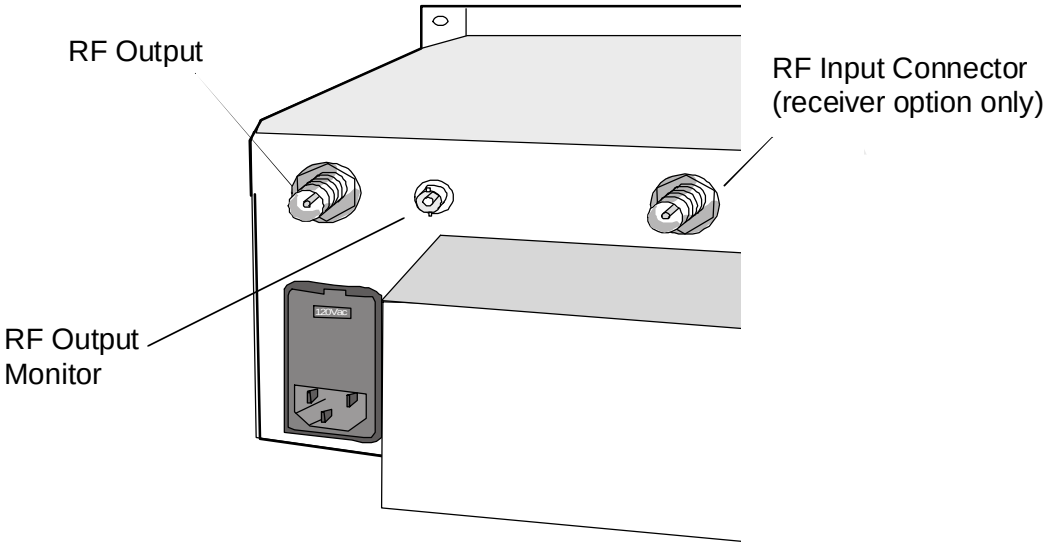


Illustration 2–6 RF Connection

2.6 Audio Input Connections

Attach audio inputs to the Left and Right XLR connectors on the rear panel. (The Left channel audio is used on Mono.) Pin 1 of the XLR connector goes to chassis ground. Pins 2 and 3 represent a balanced differential input with an impedance of about 50 kΩ. They may be connected to balanced or unbalanced left and right program sources.

The audio input cables should be shielded pairs, whether the source is balanced or unbalanced. For an unbalanced program source, one line (preferably the one connecting to pin 3) should be grounded to the shield at the source. Audio will then connect to the line going to pin 2.

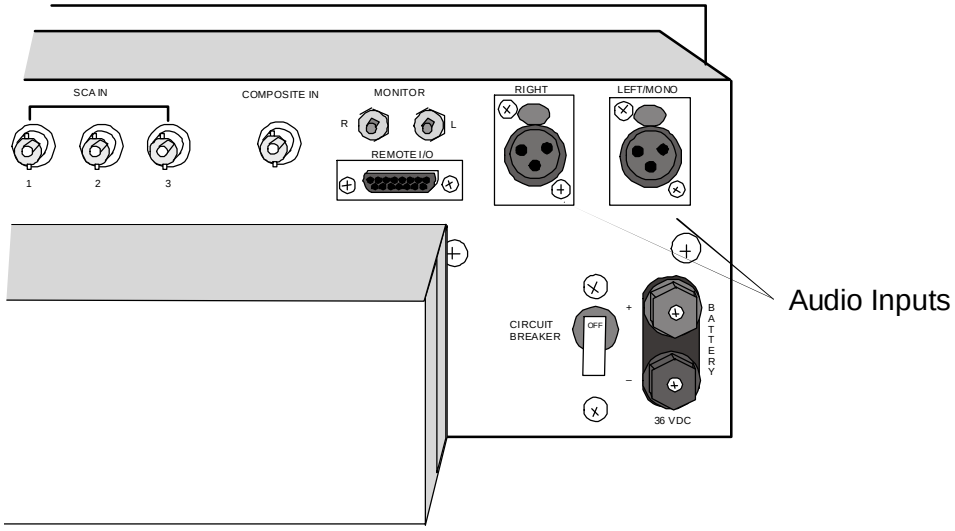


Illustration 2–7 XLR Audio Input Connections

By bringing the audio return line back to the program source, the balanced differential input of the transmitter is used to best advantage to minimize noise. This practice is especially helpful if the program lines are fairly long, but is a good practice for any distance.

If the program source requires a 600 Ω termination, install resistors on the 8–pin DIP socket on the motherboard (socket A501 located between the XLR connectors). See Illustration 2–8, Audio Input Circuit

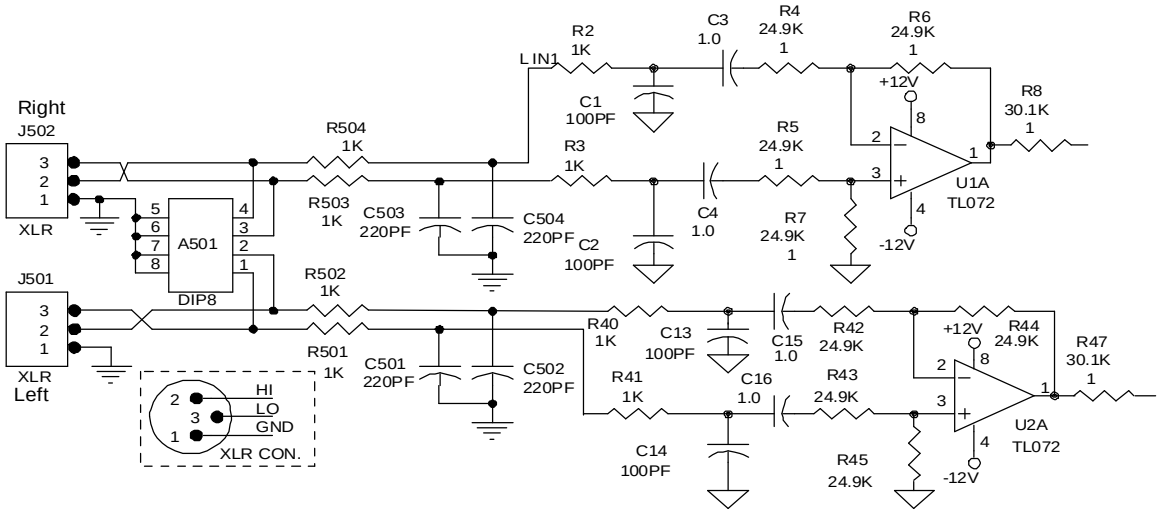


Illustration 2–8 Audio Input Circuit

2.7 SCA Input Connections

You can connect external SCA generators to the SCA In connectors (BNC-type) on the rear panel. The inputs are intended for the 60 kHz to 99 kHz range, but a lower frequency may be used if the transmitter is operated in Mono mode. (The 23 to 53 kHz band is used for stereo transmission.) For 7.5 kHz deviation (10% modulation), input of approximately 3.5–volts (peak-to-peak) is required.

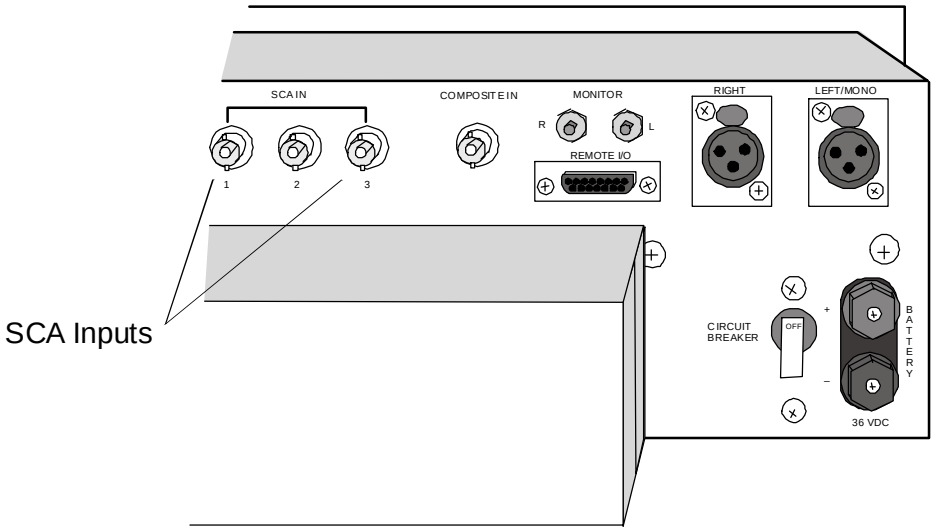


Illustration 2–9 SCA Input Connectors

2.8 Composite Input Connection

You may feed composite stereo (or mono audio) directly to the RF exciter, bypassing the internal audio processor and stereo generator. To use the Crown transmitter as an RF Exciter only (“E” version or when using the “T” version with composite input), it is necessary to use the Composite Input section of the transmitter. This will feed composite stereo (or mono audio) directly to the RF exciter. In the “T” version, this will bypass the internal audio processor and stereo generator. See Section 2.11 on the next page for caution in using the bypass option.

Input sensitivity is approximately 3.5–volt P-P for 75 kHz deviation.

1. Enable the Composite Input by grounding pin 9 of the Remote I/O connector (see Section 2–13, Remote I/O Connector).
2. Connect the composite signal to the Composite In BNC connector.

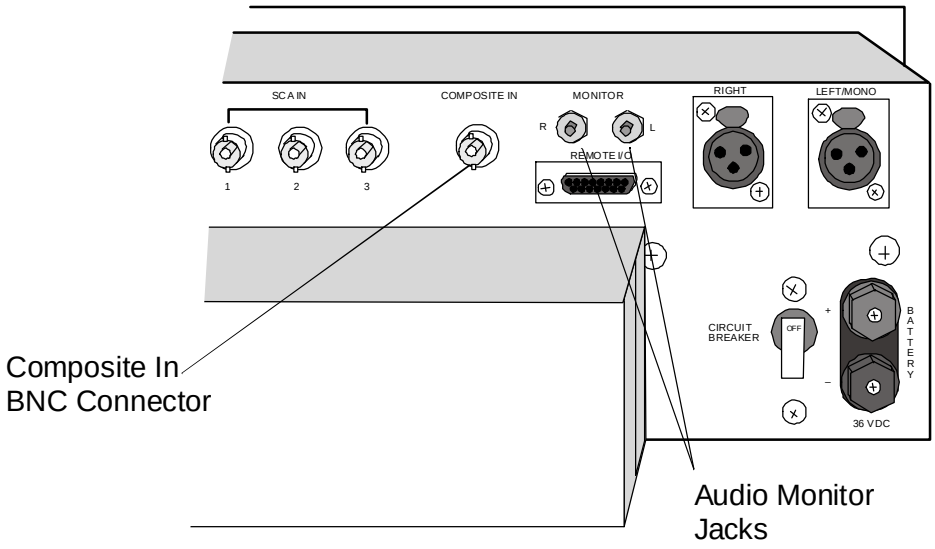


Illustration 2–10 Composite In and Audio Monitor Connections

2.9 Audio Monitor Connections

Processed, de-emphasized samples of the left and right audio inputs to the stereo generator are available at the Monitor jacks on the rear panel. The signals are suitable for feeding a studio monitor and for doing audio testing. De-emphasis is normally set for 75 µsec.; set to 50 µsec. by moving jumpers, JP203 and JP204, on the Stereo Generator board.

2.10 Pre-emphasis Selection

Select the pre-emphasis curve (75 µsec., 50 µsec., 25 µsec., or Flat) by jumpering the appropriate pins of header JP1 on the audio processor board. If you change the pre-emphasis, change the de-emphasis jumpers JP203 and JP204 on the Stereo Generator board to match. (See Section 2.8, Composite Input Connection for additional information.)

2.11 Processor Bypass Option

You may bypass the audio processor in order to feed the left and right (pre-emphasized) audio directly to the stereo generator. The Normal-Bypass slide switch is near the left-rear corner of the motherboard. If the audio source is already processed and you do not desire further processing, use the Normal mode, but turn the Processing control (on the front panel) to “0.” (See also Section 3.4, Processing Control.)

⚠CAUTION

In the BYPASS position, the pre-emphasis circuits and the filters that protect the pilot and stereo subcarrier are bypassed. As a result, the occupied bandwidth specifications of the transmitter could be compromised. The 15–Hz high-pass filters are also bypassed which may mean that modulation with frequencies below 10 Hz could cause the frequency synthesizer to unlock.

2.12 Program Input Fault Time-out

You can enable an automatic turn-off of the carrier in the event of program failure. To enable this option, selecte a setting from Table 2-3, Fault Time-out Values. The time between program failure and carrier turn-off is set by a jumper (JP701) on the voltage regulator board. (See Illustration 2–11, Chassis Bottom View, for board location).

Delay	Pins to Jumper
30 seconds	1-2 (pins closest to edge)
2 minutes	3-4
4 minutes	5-6
8 minutes	7-8

Table 2-3 Fault Time-out Values

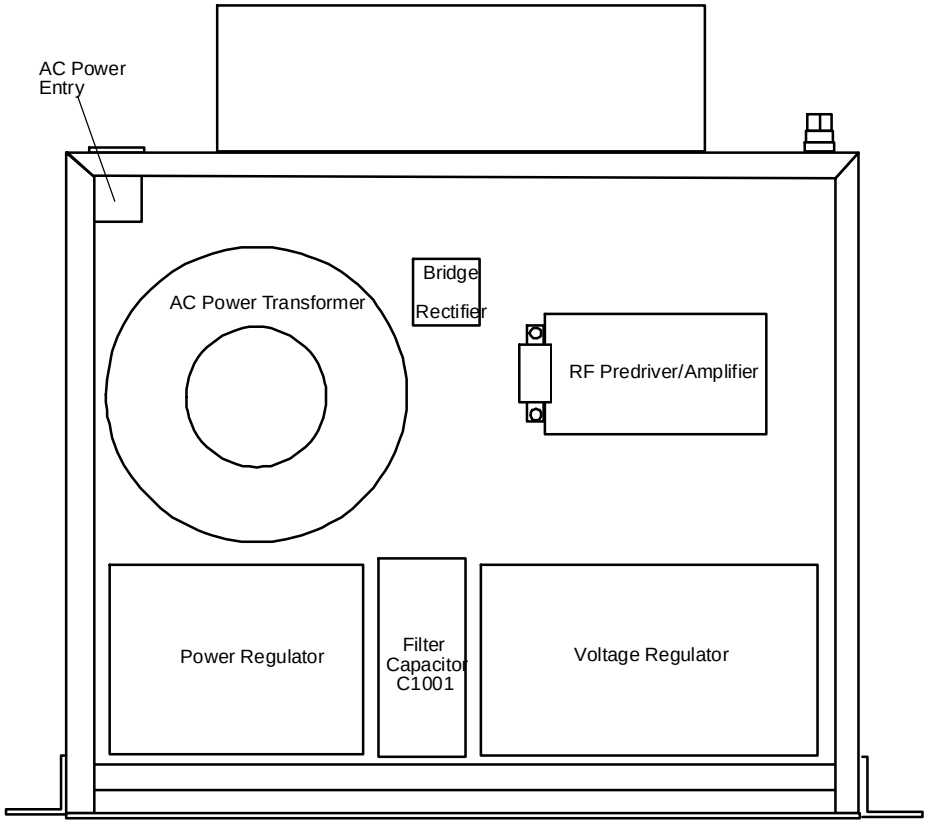


Illustration 2–11 Chassis Bottom View

2.13 Remote I/O Connector

Remote control and remote metering of the transmitter is made possible through a 15–pin, D-sub connector on the rear panel. (No connections are required for normal operation.)

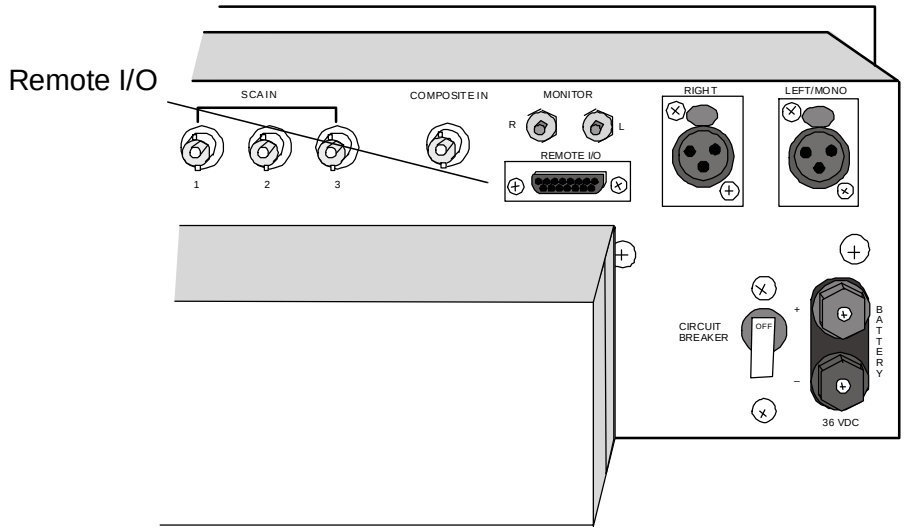


Illustration 2–12 Remote I/O Connector

Table 2-4, Remote I/O Connector, summarizes the Remote I/O pin connections.

Pin Number	Function
1	Ground
2	(no connection)
3	Composite Out (sample of stereo generator output)
4	FSK In (Normally high; pull low to shift carrier frequency approximately 7.5 kHz. Connect to open collector or relay contacts of user-supplied FSK keyer.)
5	/Auto Carrier Off (Pull low to enable automatic turnoff of carrier with program failure.)
6	Meter Battery (unregulated DC voltage; 5 volts = 50 VDC)
7	Meter RF Watts (1 volt = 100 watts)
8	Meter PA Volts (5 volts = 50 VDC)
9	/Ext. Enable (Pull low to disable internal stereo generator and enable External Composite Input.)
10	a) 38 kHz Out (From stereo generator for power supply synchronization.) b) For transmitters equipped with tuner option, this pin becomes the right audio output for an 8–ohm monitor speaker. 38kHZ Out is disabled.
11	ALC
12	/Carrier Off (pull low to turn carrier off.)
13	Fault Summary (line goes high if any fault light is activated.)
14	Meter PA Temperature (5 volts = 100 degrees C.)
15	Meter PA Current (1 volt = 10 amperes DC.)

Table 2-4 Remote I/O Connector

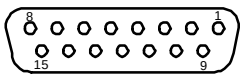
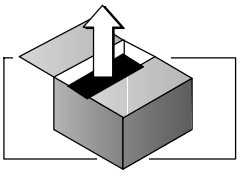
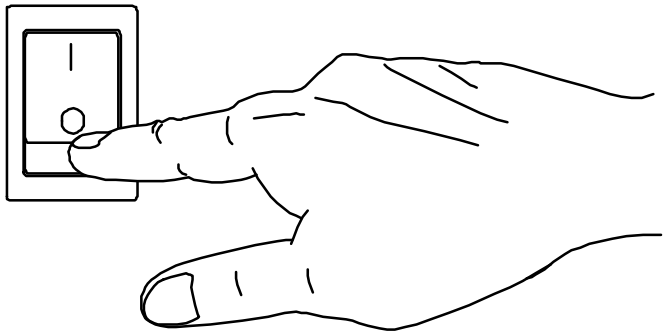


Illustration 2–13 Remote I/O Connector





Section 3—Operation

This section provides general operating parameters of your transmitter and a detailed description of its front panel display and controls.

3.1 Initial Power-up Procedures

These steps summarize the operating procedures you should use for the initial operation of the transmitter. More detailed information follows.

⚠ Caution

Possible equipment damage!

Before operating the transmitter for the first time, check for the proper AC line voltage setting and frequency selection as described in Section 2.2 and 2.3.

3.2 Controls and Display

Before operating the transmitter, take time to become familiar with the controls and indicators.

3.2.1 Front Panel

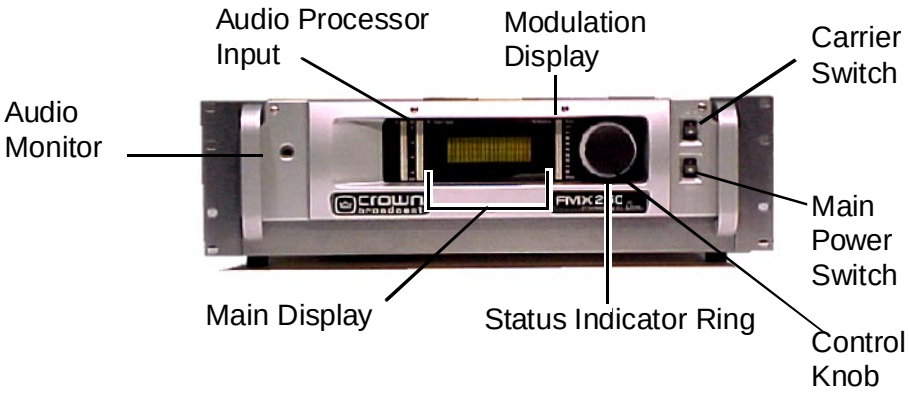


Illustration 3–1 Front Controls

Audio Processor Input Display Two vertical, bar graphs for the left and right channels indicate the relative audio levels, in 1.5 dB steps, at the input of the audio processor. Under normal operating conditions, the left and right Audio Processor indicators will be active, indicating the relative audio input level after the input sensitivity setting. During program pauses, the red Low LED will light.

Modulation Display A 20–segment, vertical peak-and-hold, bar graph displays the peak modulation percentage. A reading of “100” coincides with 75 kHz deviation. The display holds briefly (about 0.1 seconds) after the peak. The “Pilot” indicator illuminates when the transmitter is in the stereo mode.

To verify the actual (or more precise) modulation percentage, connect a certified modulation monitor to the RF monitor jack on the rear panel.

Carrier Switch This switch controls power to the RF amplifiers and supplies a logic high to the voltage regulator board, which enables the supply for the RF driver. In addition, the Carrier Switch controls the operating voltage needed by the switching power regulator.

A “Lock Fault” or a low pin 12 (/Carrier Off) on the Remote I/O connector will hold the carrier off. (See Section 2.12, Program Input Fault Time-out)

Main Power Switch The main on/off power switch controls both the 120/240 VAC and the DC battery power input.

Control Knob A push-and-turn control to access all settings and parameters. Use in conjunction with Main Display

Main Display The FMX Main Display is a four line alpha-numeric display. All critical transmitter parameters, controls and alarm settings are displayed on the Main Display.

Status Indicator Ring : Critical transmitter status is displayed by the illuminated Status Indicator ring surrounding the Control Knob. The following colors indicate transmitter status:

- Orange flashing : Start up
- Green : on the air and transmitting
- Yellow : an active fault is present
- Red : fault, RF power below 2 watts.

Audio monitor : Use the audio monitor jack to test the quality of the program audio at three different points in the audio path. The monitored point is selected with the main control and display.

- Receiver board for on-air monitoring
- Input audio
- Output of audio processor

3.2.2 DC Breaker

The DC breaker, on the rear panel, must be on (up) for transmitter operation, even when using AC power. Electrically, the DC breaker is located immediately after diodes which isolate the DC and AC power supplies.

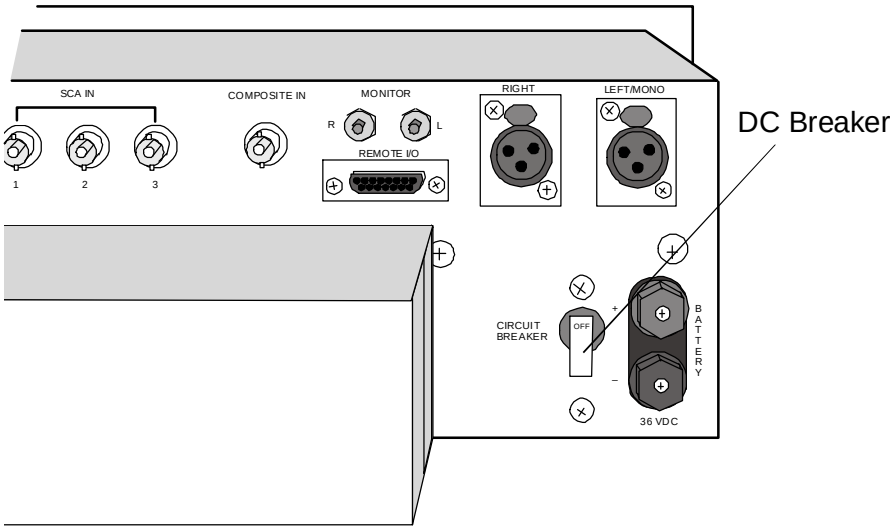


Illustration 3–2 DC Breaker

3.3 Operating the FMX

All functions except switching AC power and the carrier are controlled through the Control Knob and Main Display. To make a selection, turn the knob to scroll through a list of choices. When the cursor arrow points to the selected function, push and release the control knob to make the selection.

To enter a number or letter, use the control knob to move a flashing cursor block over characters in the selected line. When the cursor is in position, push and release the control knob. Then, turn the knob to scroll through the letter or number choices. Push and release the knob to select the choice.

3.3.1 Passwords

Settings and Factory functions require passwords to access. Only the password for Settings is distributed. The default setting for the Settings password is “0000”. You may change the Settings password from the Settings functions.

3.3.2 Main Function List

Main Function list in FMX are grouped as follows

- Readings
- Settings
- Factory
- Audio Monitor
- Fault Log

When initially powered, the main function list is displayed. Use the control knob to select one of the main functions. When a main function is selected, the main function list is replaced with a sub function list.

3.3.3 Readings Function List

Readings functions are for operators to use to verify proper operation of the transmitter. These functions are not password protected. Readings function list has two main lists. The Primary list is one which most of the common readings are taken. The Secondary list is readings that are not as common to access.

Primary list :

RF Power : Reads RF output power in watts.

% of power set : Displays the percentage of power based on the power set point.

SWR : Reads Standing wave as a ratio.

ALC : DC gain control bias used to regulate PA supply voltage.

PA Temp : PA heatsink temperature.

PA DC V : Supply voltage of the RF power amplifier.

PA DCI : Transistor drain current for the RF power amplifier.

PS DCV : Unregulated DC voltage at the input of the voltage regulators. For battery operation, this reading is the battery voltage minus a diode drop.

Voltmeter : Displays the voltage at a test point located on the front edge of the motherboard. A test lead connected to this point can be used for making voltage measurements in the transmitter. The test point is intended as a servicing aid; an alternative to an external test meter. Remember that the accuracy is only as good as the reference voltage used by the metering circuit. Servicing a fault affected by the reference affects the Voltmeter reading. The metering scale is 0 to 199.9 volts.

SECONDARY MENU :

ABC SWR lim : The analog backup circuit setting which protects the transmitter from high SWR if the digital processor fails.

ABC Cur lim : The analog backup circuit setting which protects the transmitter PA from high current if the digital processor fails.

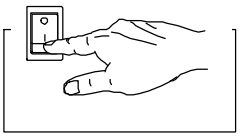
ABC Tmp Lim : The analog backup circuit setting which protects the transmitter PA from high temperature if the digital processor fails.

Tx Freq : The transmitting frequency setting.

Model # : The model number of the transmitter.

Serial # : The serial number of the transmitter.

UIC Version : Version of the software for the User Interface Control (front panel).



DPC Version : Software version of the Digital Power Control.

MDC Version : Software version of the metering digital control.

RMS Version : Version of software installed in the optional Remote Management System.

Back : Returns to previous menu function list.

3.3.4 Settings Function List

Settings functions change operating parameters and alarm limits. A password is required for access to Settings functions. Like the Readings menu, Settings menu is divided into a primary and secondary menu format. Primary menu items are more common and secondary menu items are less common.

PRIMARY :

TX : Turns carrier on or off.

RF Power Set : Sets the RF output power level

Tx freq : Sets the transmitter carrier frequency by selecting one of four pre-set frequencies (Tx1 through Tx4). These are set using the *Edit Tx freq* selection located at the end of the sub menu list of presets.
BACK : returns to the previous menu selection

Stereo : Selects the transmission mode. In Stereo Off, feed program audio only to the left channel. Although right-channel audio will not be transmitted as audio modulation, it will affect the audio processing.

Audio gain : Sets the audio input sensitivity. Choices for audio gain are:

0 dB
+ 6 dB
+12 dB
+18 dB

RF power warn : Sets level of low power level fault.

Fwd Pwr Tweak : Adjust forward power reading to correspond to a reading on a calibrated wattmeter.

Rev Pwr Tweak : Adjust reverse power reading to correspond to a reading on a calibrated wattmeter.

CPU Reset : Resets the CPU to a start-up condition. Used for troubleshooting.

ABC Override : This control puts the unit into Analog Back-up Control. The processor has no control over operation in this mode.

Back : Returns to the previous menu selection

SECONDARY :

Date/Time : Settings for the real-time clock.

New password : Change the Settings password.

RMS Board : Select RMS option ON/OFF

RMS Menu : Select this menu to change the three different phone numbers stored in the RMS unit. Phone numbers are edited directly by selecting the appropriate number. Phone # 1 will be the first number the RMS will call when there is a fault. Phone # 2 is the second in case # 1 doesn't answer. Phone # 3 is the last and then repeats to # 1.

Factory reset : Returns user settings to factory settings.

Back: Returns to previous function list

3.3.5 Factory Setting Functions

Factory settings are programmed by the manufacturer and are provided only to authorized personnel.

3.3.6 Audio Monitor

Selects one of three points for monitoring audio at the front panel monitor jack.

- RF Monitor : A built in demodulator board for on-air monitoring.
- Audio Input : A direct sample of the audio input XLR connectors
- Audio Proc. Out : A demodulated sample of the composite audio

3.3.7 Fault Log

The Fault Log displays a record of faults. Sub functions in the Fault Log are:

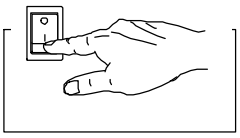
View : Displays a list of five faults starting with the most recent. Choose from the visible list or scroll forward or back to find a specific fault. The record of each fault includes:

- Event
- Date
- Time
- Value

Peak View [month/day] : Displays the highest/lowest value for the faults within any given day and the time the fault occured. These values are cleared at 00:00 hour each day. Faults listed for peak view are :
RF Power HIGH
RF Power LOW
Temp
Curr
SWR

Clear : Removes all faults from log. Before actual clearing, the unit asks for a password. It then asks if you are sure. This prevents accidental erasure.

Back : Returns to previous function list



3.4 Power-up procedure

These steps summarize the operating procedures you should use for the initial operation of the transmitter

3.4.1 Apply Power

1. Turn on the DC breaker.
2. Turn on the main power switch.
3. Verify the following:
   a. The bottom cooling fan runs continuously.
   b. The indicator ring flashes orange for approximately 10 seconds, then goes dark.

3.4.2 Enter Initial Settings

1. Choose [Setting] then [Primary] then [Tx freq] to set transmitting frequency. Choose [back] when finished.
2. Choose [Stereo] and set to ON.
3. Choose [Tx] and set to ON. Choose [Back] when finished.

3.4.3 Transmit

1. Turn on the Carrier switch
2. Check the following parameters from the [Readings] [primary] list.

RF Power : RF Power varies by model:

29–33 watts for the FMX30
95–110 watts for the FMX100
250-275 watts for the FMX250

SWR : Standing wave ratio should be less than 1.1. A reading greater than 1.25 indicates an antenna mismatch.

ALC : Automatic level control should be between 4.00 and 6.00 volts.

PA DC V : PA DC Volts varies by model, antenna match, power, and frequency
Typical readings are:

26–30 volts for the FMX30
25–35 volts for the FMX100
37-52 volts for the FMX250

PA DCI : PA DC Amperes varies with model, antenna match, power, and frequency.
Typical readings are:

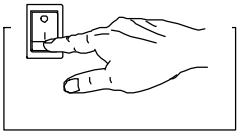
1.5–2.5 amps for the FMX30
3.04.5–6.5 amps for the FMX100
6.0–8.0 amps for the FMX250

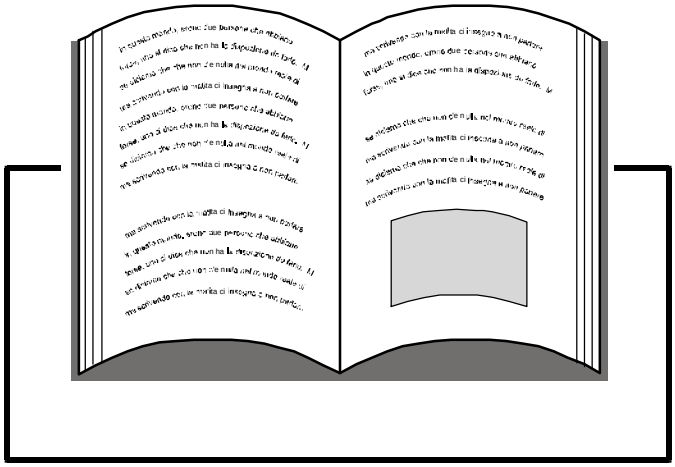
PA Temp : PA Temperature should initially read 20–35 degrees C (room temperature). After one hour the reading should be 35–50 degrees C. Maximum operating temperature is 55 degrees C.

PS DC V : Supply DC volts varies by model:

45 volts with the carrier on and 50 volts with the carrier off for both the FMX30 and FMX100 products.

FMX250, the readings should be 65 volts with the carrier on and 75 volts with carrier off.Voltmeter should be reading 0.0.





Section 4—Principles of Operation

This section discusses the basic circuit principles upon which the transmitter functions. This information is not needed for day-to-day operation of the transmitter but may be useful in understanding basic transmitter functions.

4.1 Block Diagram

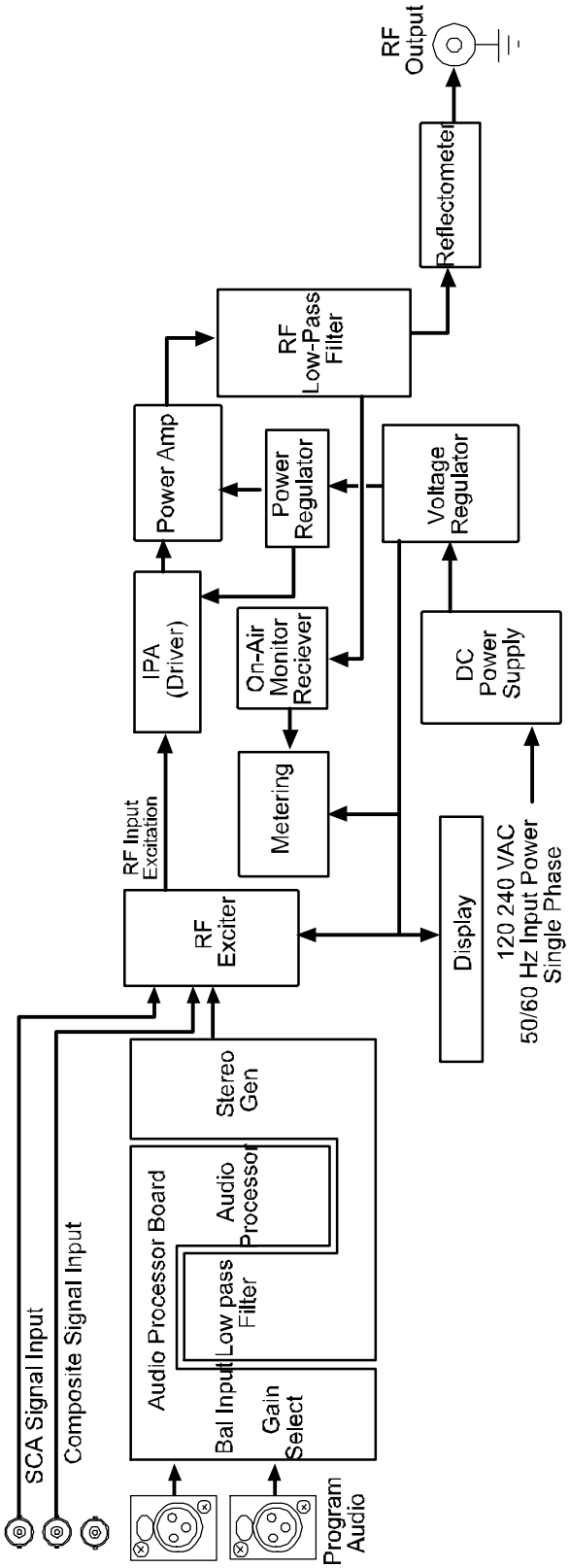


Illustration 4-1 Block Diagram

4.2 Audio Processor Circuit Board

The audio processor board (Illustration 4-2) performs five functions:

- Balanced input amplifier
- Gain selection
- Low-pass filter
- Signal compression, limiting and expansion
- Pre-emphasis

Each of these functions are discussed in the following section.

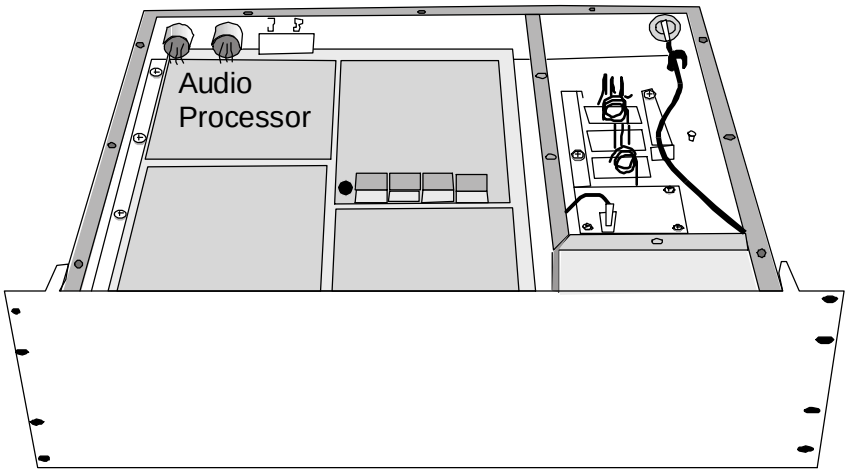


Illustration 4-2 Audio Processor Board

4.2.1 Balanced Input

Audio input from the rear-panel, XLR connectors route to differential-input amplifiers and then to a buffer amplifiers. The front panel gain switch sets one of four gain levels at the output of the buffer amplifiers. The output of the buffer amplifiers drive both the front panel indicators and a low-pass filter stage on the Stereo Generator board.

4.2.2 Audio Processor

The audio processor section provides the following audio control functions:

- Compressor
- Limiter
- Expander

The audio signal is passed through a low-pass filter on the Stereo Generator board (see Section 4.3.1). After the signal renenters the processor board an additional third-order, low-pass filter attenuates products below 30 Hz. The audio processor then takes the incoming audio—ranging in level from -20 to + 5 dBm—and modulates the transmitter to a consistent, easily understood level, without overmodulation.

The RC networks in the processor use three different time constants to cover a variety of signal conditions. Short, transient audio peaks produce quick gain reduction with quick recovery, while long term level trends produce slower gain reduction, with slow recovery. Highband processing shifts the pre-emphasis curve rather than affecting overall gain. The amount of short-term expansion and gain reduction is adjusted by control R650, located on the front panel display board.

You may select from three pre-emphasis curve, 75 µsec, 50 µsec, 25 µsec, or Flat, by jumpering the appropriate pins on header JP1. Controls R29 and R65 are for making fine adjustments to the pre-emphasis curve.

4.3 Stereo Generator Circuit Board

The stereo generator board (Illustration 4-3) generates a composite stereo signal from left and right-channel audio inputs. The Stereo Generator board also performs the following additional functions:

- Low-pass filtering for the audio processor
- Stereo generation
- SCA input
- Audio de-emphasis for the processed audio output.

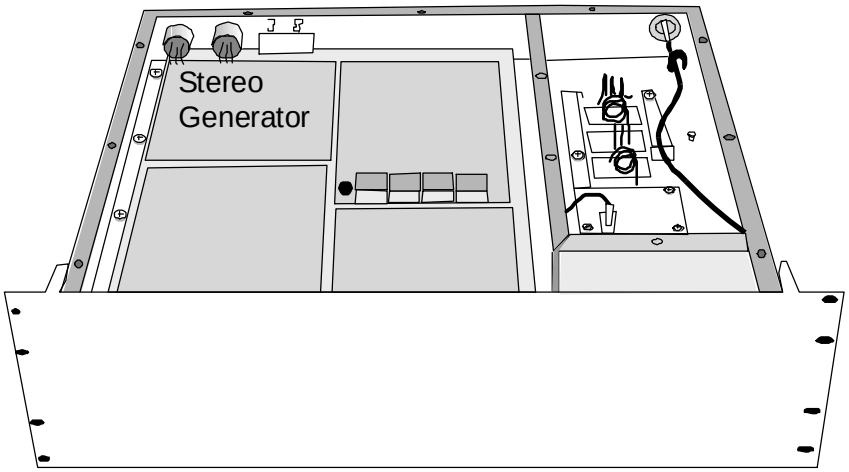


Illustration 4-3 Stereo Generator Board

4.3.1 Low-pass filter

The output of the buffer amplifier on the Audio Processor board drives the input a low-pass filter. This eighth-order, elliptical, switched-capacitor filter is located on the Stereo Generator board to take advantage of the Stereo Generator's ground plane and close proximity to the 1.52 MHz clock. The output of the filter returns to the Audio Processor board.

4.3.2 Stereo Generator

The 19 and 38–kHz subcarriers are digitally synthesized from a master 7.6 MHz crystal oscillator. The 1.52 MHz clock signal used by the low-pass filter is also derived from the 7.6 MHz master oscillator.

Stereo signals are generated by a four-quadrant, analog multiplier. The output of multiplier is the product of 38 kHz applied to the “X” input and the difference of left and right audio (L-R signal) applied to the “Y” input. The resulting output is a double sideband, suppressed carrier—the L-R subcarrier.

An analog switch at the input of the stereo generator provides selection of left and right audio for stereo and mono modes. In the mono mode, right channel audio is disabled and the left channel audio is increased from 45% modulation to 100%.

4.3.3 SCA Input

The SCA subcarrier, the left, right, and left-minus-right subcarriers, and the 19–kHz pilot subcarrier are combined into the composite stereo signal by a summing amplifier. The output of the summing amplifier is buffered to drive both the RF synthesizer and the front panel display.

4.3.4 Processed Audio

A de-emphasis network samples the stereo generator input signals and routes the de-empasised audio to the back panel to be used for a studio monitor and for audio testing. Jumpers JP203 and JP204 select between 75 and 50 µsec.

4.4 RF Exciter Circuit Board

The RF Exciter Circuit board is also known as the Frequency Synthesizer board. The entire component side of the board is a ground plane.

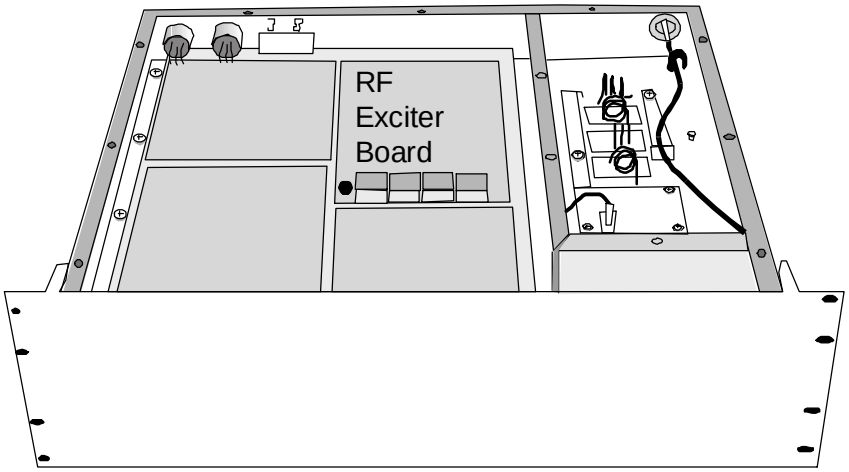


Illustration 4-4 RF Exciter Board

The frequency-synthesizer consists of the following:

- A voltage-controlled oscillator
- A frequency synthesizer integrated circuit.
- An active low-pass filter
- A micro controller

The voltage-controlled oscillator, operating at 87-108MHZ, is an LC oscillator with hyper-abrupt varactor tuning diodes comprising the dominant source of capacitance. A cast aluminum cover shields the VCO circuit from interference from stray signals inside of the transmitter. The composite audio modulation is introduced to the VCO through a resistor network.

The RF output of the VCO is returned to the frequency synthesizer IC where the signal is divided down to 10 KHz. The synthesizer also divides the 10.24-MHz crystal frequency to 10 KHz. Differences in the two frequencies appear as an error signal at the output of the frequency synthesizer. This error signal is passed through an active low-pass filter and used to correct the frequency of the VCO.

Operating frequency is programmed either from the front panel by the Digital Management System or rotary switches located along the front edge of the board. Frequency information from the switches is converted to serial BCD data by a shift register which is then converted to binary data by micro controller. The micro controller also programs the synthesizer to divide the operating frequency to 10 KHz and the 10.25 MHz clock to produce the 10 KHz reference signal.

JP301 is a jumper option used only in transmitters which have been modified for operating in the Eastern Europe 66–73 MHz band.

The frequency synthesizer also produces a lock signal. This signal is inverted and buffered to produce both lock and unlock status signals for use in other parts of the transmitter.

An FSK signal (used for automatic identification of FM repeaters) shifts the frequencies of the 10.24–MHz crystal reference and the VCO. With keying, diodes in the in the oscillator are reverse biased, increasing the crystal reference frequency. At the same time, current through R358 increases the VCO frequency.

4.5 Digital Management System

The digital management system is located on three boards:

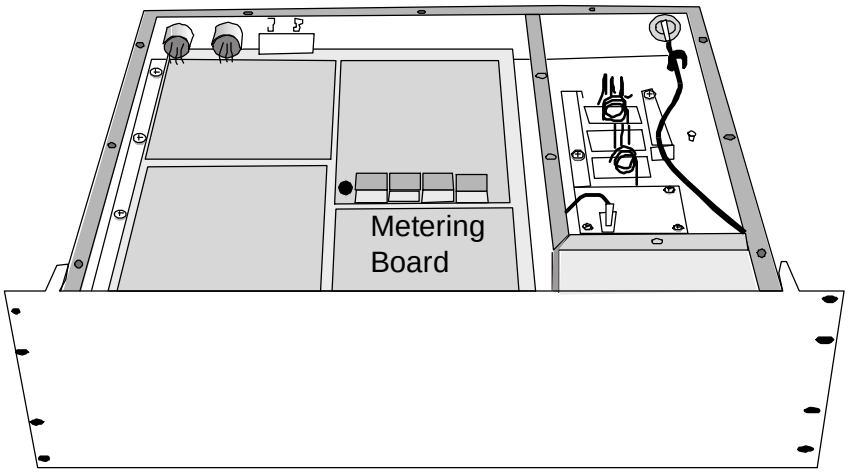


Illustration 4-5 Metering Board

- The metering board
- The metering daughter board
- Front panel controls and display

4.5.1 Metering Boards

The metering boards provide four functions:

- Scale operating parameters from various points in the transmitter to a proportional DC voltage.
- Generate the ALC signal.
- Provide backup to the microprocessor controlled functions on the front panel.
- Provide real-time clock data for the fault log.

4.5.2 Front Panel

The digital management system front panel displays and controls all functions in the transmitter. Scaled analog signals from the metering are converted to digital format for display as selected by the operator. Selected values which were created during a fault are stored for later recall in the fault-log. Real-time audio processing and modulation is displayed on bar-graph displays; other parameters are displayed on a four line alpha-numeric display.

The transmitter is controlled from a single, push-and-turn control knob. LEDs illuminate the ring around the knob to display start-up, on-air or fault conditions.

4.6 Motherboard

The motherboard is the large board in the upper chassis interconnecting the audio processor, stereo generator, RF exciter, and metering boards. The motherboard provides the interconnections for these boards, eliminating the need for a wiring harness, and provides input/output filtering.

With Normal-Bypass slide switch, it is possible to bypass the audio processor, connecting the left and right audio inputs directly to the inputs of the stereo generator.

If the audio source is already processed, and further processing is not desired, use the Normal mode instead of Bypass and set processing to “0”.

⚠ Caution

In the BYPASS position, the pre-emphasis circuits and the filter that protect the pilot and stereo subcarrier are bypassed. As a result, the occupied bandwidth specifications of the transmitter could be compromised. The 15-Hz high-pass filters are also bypassed which may mean that modulation with frequencies below 10 Hz could cause the frequency synthesizer to unlock.

If it is necessary to provide resistive terminations at the audio inputs (either line-to-line or line-to-ground), you may place resistors directly into the 8–pin DIP socket, A501, located between the XLR input connectors.

4.7 Voltage Regulator Circuit Board

The voltage regulator board is the longer of two boards mounted under the chassis toward the front of the unit. The switch-mode voltage regulator provides +12, –12, and 24 volts to the transmitter. It also contains the program detection and automatic carrier control circuits.

The 38–kHz sine wave from the stereo generator is used for a synchronization pulse. In the transmitter “T” version, synchronization is not used.

The 24–volt supply is a switching regulator running at about 35 kHz. Output voltage is controlled with a MOSFET switch.

A single integrated circuit forms the switching regulator for both +12 volts and –12 volts. It operates at about 52 kHz.

The program detection circuit discriminates between normal program material and white noise (such as might be present from a studio-transmitter link during program failure) or silence. If program audio is present, a count-down timer is continuously reset. Red and green LEDs on the board indicate the presence or absence of program determined by the balance of the detected signals from the two filters. The time between a program fault and shutdown is selected by jumpering pins on header JP701.

For delay times, see Table 4-1, Program Delay Settings. The times are proportional to the value of R721; times can be doubled by doubling the value of R721.

JP701 Jumper	Delay
3 and 4	2–minute
5 and 6	4–minute
7 and 8	8–minute

Table 4-1 Program Delay Settings

4.8 Power Regulator Circuit Board

The power regulator board is the shorter of two boards mounted under the chassis toward the front of the unit. The board has the isolating diode for the battery input, the switch-mode voltage regulator for the RF power amplifier, and circuitry for PA supply current metering. A diode in series with the battery input, together with the AC-supply diode bridge, provides diode OR-ing of the AC and DC supplies. A metering shunt samples the output current for use by the metering and display board.

4.9 RF Driver/Amplifier (FM30)

The RF Driver/Amplifier assembly is mounted on a 100 mm x 100 mm plate in the under side of the chassis. The driver amplifies the approximate 20 milliwatts from the frequency synthesizer to 30 watts. A hybrid, high-gain, wideband amplifier, operating at about 18 volts, provides about one watt of drive to a single MOSFET amplifier. The stage operates from a supply voltage of 28 volts in the FM30.

The circuit board has components for input and output coupling and for power supply filtering.

4.10 RF Driver (FM100/FM250)

The RF Driver assembly is mounted on a 100 mm x 100 mm plate in the under side of the chassis. The driver amplifies the approximate 20 milliwatts from the frequency synthesizer to about 8 watts to drive the RF power amplifier. A hybrid, high-gain, wideband amplifier, operating at about 18 volts, provides about one watt of drive to a single MOSFET amplifier operating from a supply voltage of approximately 13 volts.

The circuit board provides for input/output coupling and for power supply filtering.

4.11 RF Amplifier (FM100/FM250)

The RF power amplifier assembly is mounted on back of the chassis with four screws, located behind an outer cover plate. The RF connections to the amplifier are BNC for the input and output. Power comes into the module through a 5–pin header connection next to the RF input jack.

The amplifier is built around a Phillips BLF278 dual power MOSFET rated for 50 volts DC and a maximum power of about 300 watts. When biased for class B, the transistor has a power gain of about 20 dB. It is biased below class B in the transmitter.

Input transformer is made up of two printed circuit boards. A four-turn primary board is separated from a one-turn secondary by a thin dielectric film. Multiple resisters provided damping. A trim pot sets the bias.

The output transformer has a one-turn primary on top of the circuit board and a two-turn secondary underneath. Inductors provide power line filtering.

4.12 Chassis

The AC power supply components, as well as the bridge rectifier and main filter capacitor are mounted on the chassis. Switching in the power-entry module configures the power transformer for 100, 120, 220, or 240 VAC; see Section 2.2, Power Connections for switching and fuse information. A terminal strip with MOV voltage-surge suppressors and in-rush current limiters is mounted on the chassis between the power entry module and the toroidal power transformer.

⚠WARNING

Shock hazard!

Do not attempt to short the capacitor terminals. A bleeder resistor will discharge the capacitor in approx-imately one minute after shutdown.

The main energy-storage/filter capacitor, C1001, is located between the voltage and power regulator boards. The DC voltage across the capacitor will be 45–55 volts (FM30 and FM100) or 65–70 volts (FM250) when the carrier is on.

4.13 RF Output Filter & Reflectometer

The RF low-pass filter/reflectometer are located in the right-hand compartment on the top of the chassis.

A ninth-order, elliptic, low-pass filter attenuates harmonics generated in the power amplifier. The capacitors for the filter are circuit board pads.

The reflectometer uses printed circuit board traces for micro-strip transmission lines. Transmission line segments (with an impedance of about 82 ohms) on either side of a 50–ohm conductor provide sample voltages representative of the square root of forward and reverse power.

DC voltages, representative of forward and reflected power, are routed through a bulkhead filter board to the motherboard, then to the metering board, where they are processed for power control and metering and for SWR metering and protection.

4.14 Receiver Circuit Board Option

This option allows the transmitter to be used as a translator. The receiver board receives terrestrially fed RF signal and converts it to composite audio which is then fed into the exciter board. Microprocessor controlled phase lock loop technology ensures the received frequency will not drift, and multiple IF stages ensure high adjacent channel rejection.

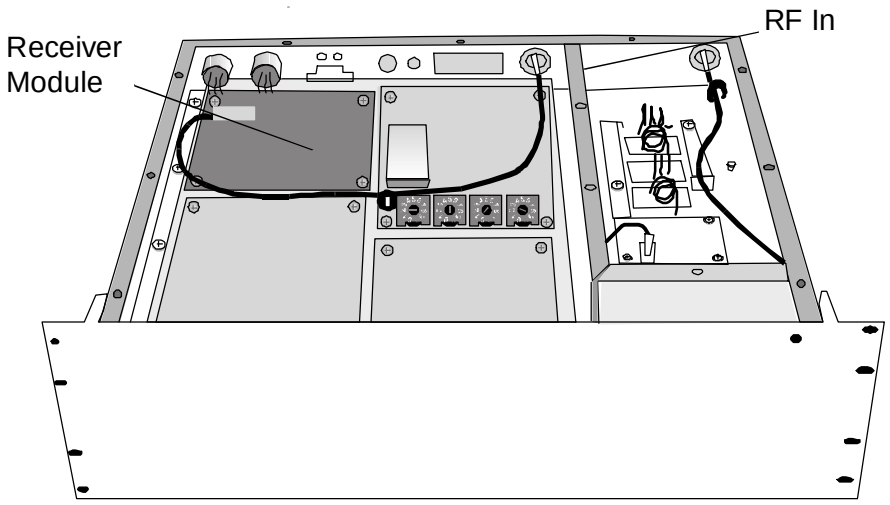


Illustration 4-6 Receiver Board

The square shaped metal can located on the left side of the receiver board is the tuner module. The incoming RF signal enters through the BNC connector (top left corner) and is tuned through the tuner module. Input attenuation is possible with jumper J1 on the top left corner of the receiver board. Very strong signals can be attenuated 20 dB automatically by placing the jumper on the left two pins (“LO” position). An additional 20 dB attenuation is also available with the jumpers in the top left corner of the board. The frequencies are tuned by setting switches SW1 and SW2 (upper right corner). The switches frequency range is 87.9 Mhz at setting “00” to 107.9 Mhz at setting “64”. Other custom ranges are available. These two switches are read upon power up by the microprocessor (U4). The microprocessor then tunes

the synthesizer to the selected frequency to produce an intermediate frequency of 10.7 MHz.

The 10.7 MHz IF frequency comes out of the tuner module and is coupled into the first filter FL1; passes through FL1 and into the IF decoder system. The FL1 filter sets the bandwidth or everything outside of the bandwidth depending on the filter that is selected. It could be a bandwidth of 180 kHz where everything outside of that is filtered out depending on the filter characteristics. A second filter (F3) is available when the signal has a great amount of interference from an adjacent signal. In such a case, remove the jumper cap that is in the F3 position, then remove the ceramic filter that is in the F4 storage position and place it into the F3 position.

Then the signal goes to an integrated circuit buffer gain stage. From there the signal passes through a second filter for further removal of unwanted products, and then routed to the IF stage of that integrated circuit. The quadrature detector detects the FM signal and converts it to a low distortion audio signal. The audio, still a composite at this point, goes to the first buffer amplifier. Then it goes through a compensation network and on to the stereo decoder chip.

When a stereo signal is present, Led 1 illuminates which indicates that left and right audio is available. The stereo signals go to gain amplifiers and then to the RCA jacks on the back of the transmitter. These can be used for off-air monitoring of the audio signal. Incoming frequency can be monitored from the frequency monitor BNC jack on the back. The stereo buffer, stereo decoder, and gain stages have no effect on the signal that goes through to the transmitter. This section along with the composite signal is totally separate from the transmitter section.

A muting circuit switches the output audio off when the incoming RF signal is too weak to produce a useful audio signal. The strength of the signal muted is determined by the adjustment of control R15. The audio signal is then routed to connector P3.

The P3 connector block allows jumpering to either internal circuitry or to external signal processing such as advertisement injection or other forms of altering the signal. If the jumper is installed for internal circuitry, the signal will go through of a buffer amplifier. The output of the buffer is adjusted by control R20 located on the top left hand corner of the board. R20 sets signal gain for 100% modulation if adjusted correctly with a full incoming 75 kHz deviation signal. Then the signal then goes through an adjustable compensation network. This allows the best stereo separation possible by adjusting and compensating for differences in FM exciter boards. The signal is buffered through U2B and finally reaches the output connectors P1 and P2, and on to the transmit circuitry.

The receiver is powered from both on-board 9 volt and 5 volt supplies and the +12 and -12 volts from the motherboard.

Section 5—Service and Support

We understand that you may need various levels of support or that the product could require servicing at some point in time. This section provides information for both of these scenarios.

5.1 Service

The product warranty (see opposite page) outlines our responsibility for defective products. Before returning a product for repair or replacement (our choice), call our Customer Service department using the following telephone number:

(866) 262-8917

Our Customer Service Representative will give you further instructions regarding the return of your product. Use the original shipping carton or a new one obtained from Crown. Place shipping spacers between the slide-out power amplifier assembly and the back panel.

Please fill out the Factory Service Instructions sheet (page 7–5) and include it with your returned product.

5.2 24–Hour Support

In most instances, what you need to know about your product can be found in this manual. There are times when you may need more in-depth information or even emergency-type information. We provide 24–hour technical assistance on your product via a toll free telephone call.

For emergency help or detailed technical assistance, call

(866) 262-8917

You may be required to leave a message at this number but your call will be returned promptly from our on-call technician.

5.3 Spare Parts

To obtain spare parts, call Crown Broadcast Sales at the following number.

(866) 262-8917

You may also write to the following address:

Service Manager
International Radio and Electronics Company, Inc.
25166 Leer Drive
Elkhart, Indiana, U.S.A. 46514-5425

Three-Year Limited Warranty

North America Only

SUMMARY OF WARRANTY

We, Crown Broadcast, a business unit of International Radio and Electronics Company, Inc., 25166 Leer Drive, Elkhart,Indiana 46515–2000 warrant to the ORIGINAL PURCHASER of a NEW Crown Broadcast product, for a period of three (3)years from the date of purchase by the original purchaser (the “warranty period”) that the new Crown Broadcast product is free of defects in materials and workmanship and will meet or exceed all advertised specifications for such a product. This warranty does not extend to any subsequent purchaser or user, and automatically terminates upon sale or other disposition of our product.

ITEMS EXCLUDED FROM THIS CROWN BROADCAST

We are not responsible for product failure caused by misuse, accident, or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loads or any ot her products or accessories resulting from Crown Broadcast product failure. It does not cover defects or damage caused by use of unauthorized modifications, accessories, parts, or service.

WHAT WE WILL DO

We will remedy any defect, in material or workmanship (except as excluded), in our sole discretion, by repair, replacement , or refund. If a refund is elected, then you must make the defective or malfunctioning component available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at our factory. Expenses in remedying the defect will be borne by Crown Broadcast, including two-way surface freight shipping costs within the United States.(Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other custom’s fee(s) for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after the expiration of the warranty period. We will give you an authorization to return the product for service. All components must be shipped in a factory pack or equivalent which, if needed, may be obtained from us for a nominal charge. Corrective actions will be taken within a reasonable time of the date of receipt of the defective product by us. If the repairs made by us are not satisfactory, notify us immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

You are not entitled to recover from us any consequential or incidental damages resulting from any defect in our product. This includes any damage to another product or products resulting from such a defect.

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this warranty. The warranty is not extended by the length of time for which you are deprived of the use of the product. Repairs and replacement parts are provided under the terms of this warranty shall carry only the unexpired portion of this warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

There is no warranty which extends beyond the terms hereof. This written warranty is given in lieu of any oral or implied warranties not contained herein. We disclaim all implied warranties, including without limitation any warranties of merchantability or fitness for a particular purpose. No action to enforce this warranty shall be commenced no later than ninety(90) days after expiration of the warranty period.

Crown Broadcast, International and Radio Company, Inc.
25166 Leer Drive, P.O. Box 2000, Elkhart, Indiana 46515–2000
Phone: (574) 262-8900; FAX: (574) 262-5399

Factory Service Instructions

To obtain factory service, complete the bottom half of this page, include it with the unit, and ship to:

International Radio and Electronics Company, Inc.
25166 Leer Drive
Elkhart, Indiana, U.S.A. 46514-5425

For units in warranty (within 3 years of purchase from any authorized Crown Dealer): We pay for ground UPS shipments from anywhere in the continental U.S. and Federal Express Second Day service from Hawaii and Alaska to the factory and back to you. Expedited service/shipment is available for an additional charge. You may ship freight collect (COD for cost of freight) or forward your receipt for shipping charges which we will reimburse. We do not cover any charges for shipping outside the U.S. or any of the expenses involved in clearing customs.

If you have any questions about your Crown Broadcast product, please contact Crown Broadcast Customer Service at:

Telephone: (574) 262-8900
Fax: (574) 262-5399

Name: _____ Company: _____

Shipping Address: _____

Phone Number: _____ Fax: _____

Model: _____ Serial Number: _____ Purchase Date: _____

Nature of the Problem: Describe the conditions that existed when the problem occurred and what attempts were made to correct it.

_____

_____

_____

_____

Other equipment in your system: _____

If warranty has expired, payment will be: Cash/Check ☐ VISA ☐ Mastercard ☐ COD ☐
Please Quote before servicing

Card Number: _____ Exp. Date: _____ Signature: _____

Return shipment preference if other than UPS Ground: Expedite Shipment ☐ Other _____

ENCLOSE WITH UNIT — DO NOT MAIL SEPARATELY